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**Fluor Fernald, Inc.**
P.O. Box 538704
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October 4, 2006

**FLUOR**

Fernald Closure Project
Letter No. C:BSOP(CA/PC):2006-0058

Mr. Timothy L. Jones, Contracting Officer
U. S. Department of Energy
EM Consolidated Business Center
250 East Fifth Street, Suite 500
Cincinnati, Ohio 45202

Dear Mr. Jones:

**CONTRACT DE-AC24-01OH20115, FERNALD CLOSURE PROJECT HAZARD SURVEY AND ASSESSMENT**

Enclosed for your approval, pursuant to Section J, Attachment 3, Technical – Safety and Health Section of the subject contract, is the "Fernald Closure Project Hazard Survey and Assessment," effective October 4, 2006.

If you have any questions concerning the enclosed, please contact Steve Wentzel at (513) 368-3788.

Sincerely,

Dennis Sizemore

Dennis Sizemore, Manager
Prime Contract

DS:SJW:jmb

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File Record Subject: Site Hazard Survey and Assessment

# Fernald Closure Project
# Hazard Survey and Assessment

## PL-2352

**Effective: October 4, 2006**

Subject Experts:

Steve Wentzel, Health and Safety Manager

Issue Authorization:

| | |
|---|---|
| *On File* | 10/3/06 |
| Don Paine<br>Safety, Health, & Radiological Control Director | Date |

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## ISSUE AND REVISION SUMMARY

| Issue Authorization Date | Effective Date | PCN No. | REV. No. | Description |
|---|---|---|---|---|
| NA | 1994 | | 0 | Original document, issued as FEMP-2352, Rev. 0, *FEMP Hazard Survey and Preliminary Hazard Categorization.* (See Section 1.4, *Background.*) |
| NA | 03-96 | | 1 | Document designation changed from FEMP-2352 to IM-2352 and issued as Rev. 1, *FEMP Hazard Survey and Preliminary Hazard Categorization.* (See Section 1.4, *Background.*) |
| NA | 10-97 | | 2 | Merged with RM-0038, *FEMP Hazard Assessment* (written for emergency preparedness). Issued as IM-2352, Rev. 2, and re-titled *FEMP Hazard Survey and Hazard Assessment.* Thereafter, the contents encompassed the requirements of emergency preparedness and safety analysis. (See Section 1.4, *Background.*) |
| NA | 11-98 | | 3 | Issued as IM-2352, Rev. 3, *FEMP Hazard Survey and Hazard Assessment*. Added: (1) the area to be used for railcar movement and storage; and (2) Areas of Concern, which contain low-level wastes (soil piles, flyash piles, and ponds). (See Section 1.4, *Background.*) |
| **Issue Authorization Date** | **Effective Date** | **UDC No.** | **REV. No.** | **Description** |
| 1/11/01 | 1/22/01 | | 0 | Supersedes IM-2352. Re-designated PL-2352, and issued as Rev. 0 of *FEMP Hazard Survey and Hazard Assessment*. Added: (1) new description of Waste Pits Remedial Action Project (WPRAP) in Facility 13; (2) new Facility Description 17 to address sitewide excavations of foundations. (See Section 1.4, *Background.*) |
| NA | 01/16/04 | | 1 | Re-titled *Fernald Closure Project Hazard Survey and Assessment*. Complete update, including: (1) removal of facilities that no longer exist; (2) removal of information that is no longer pertinent because of site closure activities; (3) addition of ISM; (4) establishment of PL-2352 as the Safety Basis for all future SIH projects and some limited RAD projects. |
| 10/03/06 | 10/04/06 | | 2 | Reviewed and updated to reflect current conditions and to remove reference to building and processes that are no longer valid. |

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## TABLE OF CONTENTS


**1.0 INTRODUCTION** ..... 6

**1.1 Purpose and Scope** ..... 6

**1.2 The Fernald Site Life Cycle** ..... 6

**1.3 Environmental Description** ..... 7
- 1.3.1 Geography and Geology ..... 7
- 1.3.2 Meteorology ..... 7
- 1.3.3 Hydrology ..... 8
- 1.3.4 Tornado Potential ..... 9
- 1.3.5 Earthquake Potential ..... 9

**2.0 HAZARDS DESCRIPTIONS AND CONTROLS** ..... 10

**2.1 Screening Thresholds** ..... 10

**2.2 Radiological Hazards** ..... 10

**2.3 Chemical Hazards** ..... 11

**2.4 Physical Hazards** ..... 13

**2.5 Potential Hazardous Chemicals** ..... 16

**2.6 Hazard Controls** ..... 17
- 2.6.1 Engineering Controls ..... 17
- 2.6.2 Administrative Controls ..... 17
- 2.6.3 Fire Protection ..... 18
- 2.6.4 Personnel Protective Equipment (PPE) ..... 18

**3.0 EMERGENCY PLANNING CLASSIFICATION** ..... 20

**4.0 REFERENCES** ..... 20


## APPENDICES


Appendix 1, SARA-312 Chemical Inventory ..... 20

# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

This hazard assessment identifies and analyzes the hazards associated with the current Fernald Closure Project (FCP) condition as it approaches final closure. At this stage, the majority of the site is a greenfield. However, some nuclear-era legacy systems will remain at the FCP. This documents the safety basis categorization developed and the Emergency Preparedness classification for the following legacy systems:

- On-Site Disposal Facility (OSDF): A large earth-covered burial site that contains about 2.9 million cubic yards of contaminated soil and debris. This debris includes some of the demolished former production facilities, their foundations, and below-grade piping. The OSDF will consist of eight cells covering about seven acres each, with a total footprint of about 123 acres, including the fence.

- Aquifer Restoration Wastewater Treatment Operations Facilities (ARWTOF): The ARWTOF includes the OSDF leachate collection system, aquifer extraction wells, a backwash retention basin, the Converted Advanced Waste Water Treatment (CAWWT) Facility (for removing uranium from aquifer groundwater and OSDF leachate), and a discharge system for pumping remediated water to the Great Miami River.

The technical analyses in this document support the following conclusions:

- The FCP qualifies as a hazard category of Less Than Nuclear (i.e., below Hazard Category 3).

- The FCP Emergency Preparedness (EP) classification is less than Alert, and therefore, does not require further classification.

This is the only active safety basis document at the FCP.

## 1.2 The Fernald Site Life Cycle

The Fernald site is a 1050-acre, government-owned, contractor-managed facility located in southwestern Ohio, about 17 miles northwest of downtown Cincinnati. From 1952 until 1989, the Fernald site provided high-purity uranium metal products to support U.S. defense programs. Large quantities of liquid and solid wastes were generated by the various site production operations. Uranium production halted in 1989 because of declining demand and a recognized need to commit available resources to environmental remediation. At this time the remediation efforts have included:

- demolition of former production facilities by demolition subcontractors,
- removal of building foundations and impacted soils by excavation subcontractors.

- construction, filling, and closing of the On-Site Disposal Facility (OSDF).
- silos waste retrieval, treatment, and shipping; and facility decontamination and demolition.
- installation of the aquifer restoration infrastructure
- implementation of the aquifer restoration pump and treat operations.
- removal of uranium contamination from site run-off and process waters.
- loading and transporting above-OSDF-WAC materials by truck and rail for off-site disposal.
- remediation of the waste pits area, WPRAP activities, and D&D of WPRAP facilities.
- waste management activities.

The majority of the site is a greenfield. However, some nuclear-era legacy systems will remain. The main technical systems requiring legacy management will be the OSDF and the Wastewater Treatment Operations Facilities (WTOF). This document identifies and analyzes the hazards associated with these systems and the applicable controls and mitigators.

## 1.3 Environmental Description

### 1.3.1 Geography and Geology

The FCP is located in the ancestral valley of the Great Miami River. This valley is about 2 miles wide at the FCP, with the floor about 200 feet below the present topography. The FCP is situated on a relatively level plain, about 580 feet above sea level. The land rises to 698 feet at the northern boundary, and slopes downward to 550 feet at Paddy's Run, a small creek on the western boundary running roughly north to south through the site.

During the initial glaciation of southwestern Ohio, the valley was filled with sand and gravel deposited by meltwater from receding glaciers. Subsequent glacier advances deposited glacial till on the subsurface of sand and gravel. Postglacial erosion by the Great Miami River and its tributaries removed significant portions of the glacial overburden and left terrace remnants that stand topographically higher than surrounding bottomlands. The geology of the FCP and its surrounding areas can be divided into three primary stratigraphic units: the bedrock, the sands and gravels of the Great Miami Aquifer, and the unconsolidated glacial overburden deposits. All of these geologic units occur within the site boundaries to some degree.

### 1.3.2 Meteorology

FCP meteorological conditions are representative of southwestern Ohio, although localized wind behavior may be influenced by local topography. The facility is situated in a valley oriented from west-southwest to east-northeast, through which the Great Miami River flows to the west-southwest. Gently rolling hills surround the site, and larger hills form the valley boundaries. The closest of these larger surrounding hills is 0.5 miles to the north and 1.2 miles to the south-southeast.

- Winds: Two major features, the Great Miami River Valley and the ridges surrounding the site, affect wind patterns. Wind flow data from the Cincinnati Airport are sufficiently representative of local conditions to serve as a database for years prior to the on-site meteorological monitoring system. The prevailing winds are from the southwest and west-southwest. The average monthly wind speeds range from 7 mph in August to 11 mph in March.

- Precipitation: The average annual precipitation for the Cincinnati area from 1960 through 1989 was approximately 41 inches and ranged from approximately 28 inches in 1963 to approximately 53 inches in 1979. The highest precipitation occurs during the spring and early summer. The maximum 24-hour rainfall event on record occurred in March 1964, when approximately 5 inches fell. Precipitation is typically lowest in late summer and fall. The average annual snowfall for the period 1969 to 1989 was approximately 24 inches, with the heaviest snowfall usually occurring in January. The highest monthly record of snowfall was approximately 32 inches and occurred in January, 1978. The maximum-recorded snowfall over a 24-hour period occurred in March, 1968, when approximately 10 inches were recorded.

- Temperature: The regional climate is defined as continental, with temperatures ranging from a monthly average of 29°F in January to an average of 76°F in July. From 1960 through 1989, the highest temperature recorded was 103°F in July, 1988, and the lowest was -25°F in January, 1977. The average number of days per year with a minimum temperature of 32°F or less is 109 days; the average number of days per year with a maximum temperature of 90°F or greater is 20 days. Frost depth ranges from 30 to 36 inches.

### 1.3.3 Hydrology

Surface Water

The FCP is located within the Great Miami River drainage basin. Storm water from the site flows to the Great Miami River primarily via Paddy's Run. This intermittent stream begins to flow to the underlying sand and gravel aquifer south of the waste pit area. About 1.5 miles south of the site, Paddy's Run empties into the Great Miami River. The average flow rate of the Great Miami River at Paddy's Run is 3,400 cubic feet per second. In 1991, the average monthly flow varied from 46,000 cubic feet per second in January to 330 cubic feet per second in November. The FCP is above the 2,000-year floodplain. Being located above the floodplain does not imply that the area is not subject to localized ponding.

Groundwater

The FCP is located above an extensive aquifer system known as the Great Miami Aquifer. The aquifer extends over 100 miles from the Ohio River to the northeast. It has been designated a sole-source aquifer because of its importance as a water supply. Groundwater usage is significant in the area, with industrial, commercial, agricultural, and domestic users tapping the aquifer. Several private/residential wells are located in close proximity to the southern FCP property boundary. The aquifer system consists of

a system of branching bedrock valleys varying in width and extending up to 200 feet deep.

The groundwater flow in the aquifer enters the FCP from the northeast, northwest, and west; the flow exits toward the Great Miami River Valley to the south and toward the Great Miami River and the Southern Ohio Water Company production wells to the east of the site. In the northern and central portions of the FCP, groundwater flow is eastward in response to the large capacity pumping wells of the Southern Ohio Water Company.

### 1.3.4 Tornado Potential

A probabilistic risk assessment for a tornado occurrence per square mile within Ohio was performed for the site based on data accumulated from Ohio during the years 1978 and 1990. The annual probability was calculated to be 1.25E-04 per square mile per year.

### 1.3.5 Earthquake Potential

The FCP is located on the eastern edge of the stable central physiographic province. The central stable region represents the interior of the American tectonic plate, and this area has been relatively undisturbed since Precambrian time. Two distinct geologic features exist in the central stable region near the FCP: (1) the Cincinnati Arch, which extends northward from Tennessee to the western border of Ohio and Kentucky; and (2) the Findlay Arch, which extends northeastward in the northwest corner of Ohio and intersects the Bowling Green fault zone.

Faulting in the areas of the FCP is limited. The Bowling Green fault lies approximately 120 miles to the north of the site, and an unnamed fault zone extends from Kentucky to about midway between Cincinnati and Portsmouth, Ohio. The active New Madrid fault zone lies about 300 miles away.

On a scale of zero to four, a seismic risk zone (measurement of earthquake intensity) of one has been assigned to the FCP (Uniform Building Code). The presence of minor faults at the FCP cannot be completely dismissed because Paleozoic rocks in the area are largely covered by Pleistocene sediment, and fault traces older than Pleistocene could be obscured. However, the historical record of seismic activity and the absence of post-Wisconsin faults show that significant damage from local earthquakes at the FCP is unlikely. Throughout the 19th and 20th centuries, no damaging earthquakes have been recorded within 71 miles of the FCP. Nine earthquakes caused minor damage between 71 and 199 miles from the FCP, and one earthquake caused localized, moderate damage at Anna, Ohio, about 81 miles north of the site.

# 2.0 HAZARDS DESCRIPTIONS AND CONTROLS

This section discusses specific FCP hazards and their mitigators. Most of these hazards are associated with Wastewater Treatment Operations Facilities (WTOF) activities.

## 2.1 Screening Thresholds

The objective of this section is to identify hazards that are significant enough to warrant consideration in a facility's hazardous material program. Hazards, as defined in this section, refer to hazardous non-radiological or radiological material, relative to emergency management DOE Order 151.1B (DOE 2003).

**Radiological Screening Methodology**
Radionuclides are screened using quantities listed in 10 CFR 30.72 Schedule C (NRC 2005) and the screening is performed in two parts. First, if the inventory of any listed radionuclide exceeds its respective 10 CFR 30.72 screening quantity (SQ), the entire inventory must be carried forward for further consideration. Second, if the sum of all the ratios of the inventory quantity of each radionuclide compared to that radionuclide's SQ is greater than one, the entire inventory must be carried forward for further consideration. If the inventory is less than these criteria, then the entire inventory may be eliminated from further analysis.

**Non-Radiological Screening Methodology**
Non-radiological hazards are screened against the lowest quantity listed as a TQ in 29 CFR 1910.119 (Labor 2005) or 40 CFR 68.130 (EPA 2005a), or TPQ in 40 CFR 355 (EPA 2005b). No chemicals can be screened out that exceeded either a TQ or TPQ (regardless of its status as an airborne hazard). For chemicals not listed, the DOE Emergency Management Guide EMG (DOE 1997) provides for the discretionary use of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities found in 40 CFR 302.4 (EPA 2005c). The DOE EMG also provides further criteria for eliminating materials from consideration in the EPHA.

## 2.2 Radiological Hazards

Radiological contamination hazards may potentially occur as a result of tank/line ruptures, process spills, or natural phenomena. Worker training, engineering and administrative controls, contamination control practices, and PPE are used to control radiological contamination hazards. The principles employed to keep radiation exposures As Low As Reasonable Achievable (ALARA) are used to control worker exposures to external radiation fields and radioactive contamination. The policies and objectives "for controlling personnel exposure to radioactive material are primarily implemented through the issuance of documented work controls.

<u>Uranium</u>
Uranium contamination from past processing is, by far, the most likely radiological hazard to be encountered within the waste streams. The primary isotopes of most

uranium contamination are long-lived alpha emitters. These include U-238, U-235, and U-234. The significant uranium decay products (i.e., Th-234, Th-231, and Pa-234m) decay by beta particle emission, which gives rise to shallow or eye dose potential and an increase in external penetrating radiation to levels above background.

Thorium
To a far lesser extent, wastewaters could expose workers to residual thorium in the form of compounds or metals. Ingestion, inhalation, and external exposure to thorium increase the potential for radiocarcinogenic effects. The primary isotope is Th-232. Th-230 and Th-228 are also present as a residue from uranium ore or ore-concentrate processing.

Radium
Radium-226 was the primary radioactive component in Silos 1 & 2 waste. Radium is also a long-lived decay product of both uranium (Ra-226) and thorium (Ra-224). Exposure concerns related to radium include external (from gamma-emitting daughters) and internal (due to the production of radon gas during decay). While the majority of the radium-bearing materials were removed during the Silos Project, some residual amounts of radium have been encountered in the Storm Water Retention Basin, Storm Sewer Outfall Ditch, Paddy's Run Oxbow, and the Waste Pits areas of the site.

OSDF Facility
This facility has completed the placement phase and has a designed cap system installed. With the OSDF cap completed, radiological events as a part of construction are no longer possible. This completed OSDF system is in a stable condition as an industrial landfill and presents no credible risk to site workers or the public.

CAWWT Facility
This water treatment facility processes storm water prior to being discharged to the Great Miami River. The facility is in operation as a result of an agreement between the DOE and OEPA to remove trace amounts of radioactive contamination from the stormwater stream. The process is a mature filtering system that is proven to be both effective and safe to operate. The contamination is trapped in a tank filter resin system. The impact of any piping or tanks failures would not result in unacceptable personnel or public exposures.

In accordance with the screening thresholds defined in section 2.1 above, the entire FCP radiological inventory can be eliminated from further analysis/hazard review.

## 2.3 Chemical Hazards

Several ARWTOF work processes involve the handling and storage of hazardous chemicals, such as strong acids (hydrochloric and phosphoric), bases (sodium hydroxide, soda ash, lime), and hypochlorite salts. Safe storage and handling requirements, as well as appropriate controls to prevent and mitigate the hazards associated with these chemicals, are described in the MSDSs. Safety in handling hazardous materials depends, to a great extent, upon the effectiveness of employee

education, proper safety instructions, adequate supervision, and the safe use of equipment. The quantity of hazardous materials is limited to a short term need and well below the threshold planning quantity. Most of the materials are classified as a same day use supply. The vendor performing the fieldwork activity will supply the materials for the work scope and remove any unused materials.

CAWWT Chemical Processes

Hazardous material quantities in use at the CAWWT are equal to or less than those used for the threshold calculations in the original AWWT Final Safety Analysis Report (FSAR). The original AWWT FSAR exceeded the hazardous material thresholds due only to the quantity of sulfuric acid proposed for use in the AWWT system. This hazard has been eliminated because the sulfuric acid addition system was removed as part of the plant conversion to CAWWT.

Wastewater contaminants are known primarily to consist of low amounts of uranium, zinc, manganese, nickel, lead, technetium-99, nitrate, arsenic, boron, molybdenum, carbon disulfide, trichloroethene, antimony, and fluoride.

Well Rehabilitation Chemicals

Well Rehabilitation requires sodium hypochlorite, sodium thiosulfate, hydrochloric acid, phosphoric acid, sodium carbonate, sodium bicarbonate, and NW-310.

- Sodium hypochlorite: The principal hypochlorite salts produced commercially are calcium, sodium, lithium, and potassium. All of these hypochlorite salts are water-soluble. Generally they are used for bleaching processes, as disinfectants, and in drinking water treatment.

  Hypochlorites are stable at room temperature. When mixed with water, the hypochlorite forms an alkaline solution (—12.5 pH). Accidents involving explosions have occurred as the result adding small amounts of the hypochlorite solutions to large quantities of strong acids in confined volumes. It is suspected that these explosions result from the initial heating attributable to acid dilution, and the rapid degradation of the metal hypochlorite into a chlorite and oxygen gas. At elevated temperatures, and when combined with warm water, sodium hypochlorite will release very dangerous chlorine gas.

- Thiosulfate salts are generally mixed with hypochlorite salts as an anti-chlorinating agent to remove/prevent soluble chlorite contamination. Sodium thiosulfate is a water-soluble salt used to remove surplus chlorine. Sodium thiosulfate reacts with oxidizing agents. Hazardous decomposition products include oxides of sulfur and hydrogen sulfide.

- Hydrochloric acid is extremely corrosive and may cause severe burns upon contact. Hydrochloric acid reacts with oxidizing agents (e.g., hypochlorites) and generates heat if added to water. Incorrect or inadvertent mixing of these chemicals may result in uncontrolled reactions and release of toxic gases.

- Phosphoric acid is a colorless, odorless liquid that is highly corrosive. Phosphoric acid can cause severe burns to the eyes and skin on contact. Severe respiratory and digestive tract irritation or burns can occur from inhalation or ingestion. At flame temperatures, phosphoric acid emits toxic phosphorous oxide fumes.

- NW-310, an acid enhancer, is corrosive to skin and eyes and may cause discomfort or rash. Overexposure by inhalation may include irritation or corrosion of mucous membranes with upper and lower respiratory irritation. Overexposure by ingestion may include irritation or corrosion of mucous membranes with stomach discomfort, nausea, and prostration. NW-310 should not be stored with strong alkaline material or oxidizers, and should not be mixed directly with strong acids.

- Sodium carbonate is soda ash, which is a powder used to neutralize acid.

- Sodium Bicarbonate (baking soda) is also used for well rehabilitation.

Safe storage and handling requirements, as well as appropriate controls to prevent and mitigate the hazards associated with these chemicals, are described in the MSDSs. Safety in handling hazardous materials depends, to a great extent, upon the effectiveness of employee education, proper safety instructions, adequate supervision, and the safe use of equipment. The applicable requirements are specified in documented work controls.

## 2.4 Physical Hazards

The following sub-sections describe the primary physical hazards that are typical to most FCP tasks. The majority of the work supporting ARWTOP processes involves industrial water treatment operations and field activities. The physical hazards associated with these activities are Standard Industrial Hazards (SIHs). Physical hazards are prevented and mitigated through adherence to accepted industrial practices as well as documented work controls initiated and maintained by the legacy management contractor.

Heat Stress

All personnel could potentially be affected by heat stress. The overall physical condition of workers and their current level of acclimatization to work in the heat can influence the amount of stress placed on individuals. Other factors such as temperature, relative humidity, work function, intake of fluids, PPE, and duration of time exposed to elevated temperatures can greatly affect worker safety. The FCP has safety requirements for the control of heat stress related issues.
Three heat stress conditions of concern are:

- Heat Cramps - Characterized by uncomfortable muscle spasms in the limbs or abdomen. Treatment includes administering liquids and seeking medical attention.

- Heat Exhaustion - Symptoms include pale, cool, moist skin; heavy sweating; dizziness; headache; loss of appetite; drowsiness; nausea and fainting. Treatment includes resting in a reclining position until water balances are restored, administration of fluids (no caffeine), and seeking immediate medical attention.

- Heat Stroke - By far the most dangerous, and a potentially deadly, condition of heat stress. Heat stroke can develop with little or no warning and is recognized by red, hot, dry skin, a lack of perspiration, nausea, high temperature, dizziness and confusion, and a weak, rapid pulse. Treatment includes seeking immediate medical attention, and cooling down the affected person by immersion in cool water or by wrapping in a wet sheet with vigorous fanning with cool, dry air.

Cold Stress

Tasks may be conducted when low temperatures present a potential cold stress hazard. Each worker is to learn the symptoms of cold stress and be able to recognize these symptoms in themselves and in other workers. The FCP has safety requirements for the control of cold stress related issues.

Exposure to the cold can cause hypothermia, frostbite, and other abnormalities. Frostbite occurs when the fluids around body tissue freeze due to inadequate circulation or inadequate insulation. Frostbite can be serious and can result in scarring, tissue death, or amputation. Early warning signs of frostbite include a feeling of excessive cold and possibly tingling or pain - usually in the nose, cheeks, ears, fingers, or toes. Symptoms are a change in the skin color to white or grayish-yellow, then red, and then black as the tissue dies, pain (which may subside), possible blistering, and coldness and numbness to the affected part.

Hypothermia (reduced body temperature) is a potentially deadly condition characterized by severe, uncontrollable shivering, slurred speech, memory lapses, and incoherence. Other symptoms include extreme exhaustion or sleepiness, slow, irregular breathing, and low blood pressure. Hypothermia can result in collapse and death.

Slips, Trips, and Falls

Serious injury or fatality could result from slips, trips, and falls. Areas where personnel are expected to walk are to be kept free of debris. Debris is to be removed as soon as possible or at the end of each shift. The FCP has safety requirements for the control of fall protection related issues.

Fall protection is implemented on unprotected scaffolding and ladders at working heights specified in the documented work controls. When fall protection creates a greater hazard, an alternate method must be approved by management.

Pinch Points, Punctures/Cuts

Workers are provided work gloves appropriate for the type of work they are performing. Work area walkdowns should be used to develop measures to prevent

injuries by identifying potential pinch points and sharp edges so that incidental contact is avoided.

Fire

Fire hazards resulting from the storage, movement, handling, and transport of chemicals are addressed in the MSDSs. The MSDSs also describe safe storage and handling requirements and the appropriate controls to prevent and mitigate the hazards associated with these chemicals. Safety in handling hazardous materials depends, to a great extent, upon the effectiveness of employee education, proper safety instructions, adequate supervision, and the safe use of equipment. The FCP uses a "hot" work permitting system that is included in FCP safety requirements.

Fires can also be initiated through poor housekeeping practices. Unnecessary combustible materials (i.e., trash, wooden skids, and other debris) are to be kept from accumulating within WTOF work areas. Work areas are required to be kept clean and orderly. Appropriate waste containers are made available to workers. Aisles and doors are required to be clear from obstructions and accessible.

Grass fires and wild land fires can result from natural phenomena (i.e., lightning) and from human carelessness. Facility damage from such fires can be mitigated by maintaining firebreaks around OSDF and WTOF.

FCP fire protection is discussed in detail in SECTION 2.6.3.

Overhead Electrical Lines

Working with elevated equipment, such as a well rig, may involve work in close proximity to overhead electrical lines. Work around overhead electrical lines introduces electrical hazards to the workers and equipment. During pre-job walkdowns, overhead electrical lines should be identified. Maintaining safe work distances from the overhead line controls these hazards.

Electrical Power

Ground fault circuit interrupters (GFCIs) are required temporary and all construction circuits at the work sites. The GFCIs are placed at the source of the electrical service to protect both the cord and the connected devices. The FCP has safety requirements for the use of GFCI's.

Flexible cords (i.e., extension cords) used at the FCP are required to be approved (i.e., UL listed) cord sets and to be of a type rated for hard usage and damp locations. Where there is potential for damage or tripping hazards if left on the ground, cords are run overhead and out of the way.

Loss of Control or Mechanical Hazards

Workers are trained in the use of specific equipment for operations and maintenance. Safety in equipment use and maintenance depends, to a great extent, upon the effectiveness of employee education, proper safety instructions, adequate supervision, and the safe use of equipment.

Thermal Hazard
There is no more steam used in WTOF processes. The boilers are out of service permanently. Gas heat will be used until project closure.

Animals
During site operations, animals such as dogs, cats, raccoons, skunks, mice, Canadian geese, and snakes may be encountered. These animals may carry disease and may attack if provoked. If stray animals are present at the work site, workers should stand clear of animals and notify their supervisor.

Insects
Insects and other arthropods, such as mosquitoes, spiders/ticks, mites (chiggers), bees, and wasps could be present at the sites during certain times of the year, making chances of a bite possible. Although bites can be painful, they rarely cause death. However, some people have a severe allergic reaction to an insect bite or sting that can result in a life-threatening condition. If insects are prevalent at the worksite, workers should stand clear and notify their supervisor.

Plants
The potential for contact with poisonous plants exists when performing fieldwork. Poison ivy, oak, and sumac may be present at any site. Poison ivy can be found as "hairy" vines with three-leaf notched leaf clusters on trees and as upright bushes. Poison oak resembles poison ivy. But there are five-leaf clusters, and the leaves are less notched and rounded at the ends. Both poison oak and poison ivy have white berries and red or yellow foliage in the fall of the year. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters.

Contact with poison ivy, oak, or sumac may lead to a skin rash in susceptible individuals. Rashes result from a toxin found in the sap that is contained in the stems and roots and is exuded from the leaves. Washing with cool water and soap soon after skin contact can reduce the skin reaction in susceptible individuals.

## 2.5 Potential Hazardous Chemicals

The following are the pertinent chemicals that were listed on the 2005 SARA 312 Listed Chemical Report. Each of the materials will be reviewed to determine if they meet or exceed the screening threshold limits based on current of future quantities or if they are still at the FCP. The items that appeared on the SARA 312 report in 2005 that are not longer on site will not be apart of this hazard survey assessment.

Diesel Fuel No.2
Most of the diesel fuel that is used at the FCP is delivered and dispensed directly to the heavy construction equipment by an offsite vendor. At this time only a few small (approximately 500 gallon each) fuel tanks remain in the construction areas to support

construction activities. It is in the same form and concentration that is commonly for distribution and use by the general public. Based on the current conditions, no unique hazards are present and no additional assessment is required.

Calcium Oxide

Calcium Oxide (Quik-solid) is used in construction areas to reduce the amount of free liquids (water) in the soil after rain events. The balance of this material will be used as needed by mixing directly with wet soil in the field by heavy equipment. These bags of product are not stored within any buildings and are not creating any other unusual hazardous condition. This is a common construction product that is used to improve wet soil conditions after a rain event. Based on the current conditions, no unique hazards are present and no additional assessment is required.

Lubricants

The remaining lubrication products are stored and used in small quantities at different work areas around the FCP. These products are "off the shelf" commercially available automotive products in the manufactures' provided container with all required product labeling. Vendors performing repair or service on the construction equipment bring in lubricants for their own exclusive use, as needed. These products stay on the service vehicle and are not stored at the FCP. Based on these limited quantities and the field conditions, and that they are commonly used by the general public no unique hazards are present and no additional assessment is required.

## 2.6 Hazard Controls

FCP manages hazards through the application of Standard Industrial Hazards (SIHs) that are controlled and mitigated through compliance with U.S. Occupational Safety and Health Administration (OSHA) standards.

### 2.6.1 Engineering Controls

Engineering controls anticipated for use during WTOF activities include, but are not limited to:

- Hazardous material containment.
- HEPA-filtered vacuum cleaners, which may be used to promote ALARA by removing loose contamination from facilities surfaces and work clothing (or for general area cleaning).

### 2.6.2 Administrative Controls

The legacy management contractor will determine the hierarchy of administrative controls necessary for surveillance, operations, maintenance, and routine material storage/handling activities. These controls will be guided by accepted industrial practices and the appropriate governmental regulations.

### 2.6.3 Fire Protection

Site fire protection will be provided by the local community. The FCP site will have water for fire protection available at a rate of 300 gpm. A single hydrant is currently available near 94K warehouse. This will NOT be an adequate water supply for fire apparatus and the community fire department will have to establish an alternate water supply such as water tanker shuttles. Future modifications to the underground water system could change this situation.

The alarm system in CAWWT will have a stand-alone fire alarm system consisting of smoke and/or heat detectors and manual pull stations. This system will only alert the occupants of the building with horns and strobe lights. FCP personnel will have to call 911 to summon emergency response.

The main CAWWT building has no automatic sprinkler system. However, there are modular trailer units inside the CAWWT where administrative and lab work is performed. These units have a domestic sprinkler (i.e., connected to the tap water line) installed in each of the 3 modules. Portable fire extinguishers will be present in the CAWWT facility.

The OSDF has been designed to be unaffected by a surface grass fire. However, the potential for grass and wild land fires will have to be managed by the FCP contractor through the maintenance of firebreaks around OSDF and WTOF.

Combustible loading in the CAWWT facility should be limited and housekeeping maintained by the FCP. There will be a fire watch during any cutting/welding work as required by the permitting process.

### 2.6.4 Personnel Protective Equipment (PPE)

The levels of PPE and respiratory protection (PPE/RP) are specified in the documented work authorization controls. Respiratory protection, such as Air Purifying Respirators (APRs) and/or Powered Air-Purifying Respirators (PAPRs), may be required during WTOF activities if deemed appropriate by analysis, or if air sample results indicate that airborne levels of hazardous materials are above threshold values. The thresholds for respiratory protection take into account the protection factor of the respiratory protection.

Modification to the level of PPE/RP may be required based on field monitoring and conditions. Modifications to PPE/RP requirements, as specified in the documented work controls, may be necessary if work area conditions change. Should condition changes result in a modification of the PPE/RP requirements, the modification will be based on a review of specific hazards, weather, work conditions, operating conditions, or air monitoring data.

All personnel are responsible for reviewing the permits and posted PPE/RP requirements and adhering to those requirements. All personnel must stay abreast of potentially changing work area conditions and requirements.

## 3.0 Emergency Planning Classification

Emergency classification is detailed in PL-3020, *FEMP Emergency Plan* {Ref. i], per DOE Order 151.1, *Comprehensive Emergency Management System* [Ref. 9]. Events that operationally involve or affect the FCP are grouped into seven categories. The categories in order of increasing severity are as follows: Loggable Event, Significance Category 4, Significance Category 3, Significance Category 2, Significance Category R, Significance Category 1, and Operational Emergency. The Operational Emergency level has been further subdivided for hazardous material events (EP Non-Radiological) into three classes of increasing severity: Alert, Site Area Emergency, and General Emergency. An Operational Emergency event does not require classification into one of these subclasses (i.e., it is possible for an event to be classified simply as an Operational Emergency).

## 4.0 REFERENCES

1. PL-3020, *FEMP Emergency Plan,* Fluor Fernald

## APPENDIX 1

## HAZARDOUS CHEMICALS
## 2005 SARA 312 Listed Chemicals

Absorbents
Aluminum Sulfate
Bentonite
Calcium Oxide
Diesel Fuel No.2
Lubricants
Sodium Chloride

As reported under Section 312 of the Emergency Planning and Community Right-to-Know Act of 1986 and Section 3750.0 of the Ohio Revised Code.